Geophysical Research Abstracts
Vol. 18, EGU2016-7359-3, 2016
EGU General Assembly 2016

SMOS sea surface salinity maps of the Arctic Ocean

Carolina Gabarro, Estrella Olmedo, Antonio Turiel, Joaquim Ballabrera-Poy, Justino Martinez, and Marcos Portabella

Institut de Ciencies del Mar (CSIC), Physical Oceanography, Barcelona, Spain (cgabarro@icm.csic.es)

Salinity and temperature gradients drive the thermohaline circulation of the oceans, and play a key role in the ocean-atmosphere coupling. The strong and direct interactions between the ocean and the cryosphere (primarily through sea ice and ice shelves) is also a key ingredient of the thermohaline circulation.

The ESA's Soil Moisture and Ocean Salinity (SMOS) mission, launched in 2009, has the objective measuring soil moisture over the continents and sea surface salinity over the oceans. Although the mission was originally conceived for hydrological and oceanographic studies [1], SMOS is also making inroads in the cryospheric monitoring. SMOS carries an innovative L-band (1.4 GHz, or 21-cm wavelength), passive interferometric radiometer (the so-called MIRAS) that measures the electromagnetic radiation emitted by the Earth's surface, at about 50 km spatial resolution wide swath (1200-km), and with a 3-day revisit time at the equator, but a more frequent one at the poles.

Although the SMOS radiometer operating frequency offers almost the maximum sensitivity of the brightness temperature (TB) to sea surface salinity (SSS) variations, this is rather low, , i.e.: 90% of ocean SSS values span a range of brightness temperatures of only 5K at L-band. This sensitivity is particularly low in cold waters. This implies that the SSS retrieval requires high radiometric performance.

Since the SMOS launch, SSS Level 3 maps have been distributed by several expert laboratories including the Barcelona Expert Centre (BEC). However, since the TB sensitivity to SSS decreases with decreasing sea surface temperature (SST), large retrieval errors had been reported when retrieving salinity values at latitudes above 50^0N.

Two new processing algorithms, recently developed at BEC, have led to a considerable improvement of the SMOS data, allowing for the first time to derive SSS maps in cold waters. The first one is to empirically characterize and correct the systematic biases with six years of SMOS data acquisitions. The second is the modification of the filtering criterion to account for the statistical distributions of SSS at each ocean grid point. This allows retrieving a value of SSS which is less affected by outliers originated from RFI and other effects.

We will provide an assessment of the quality of these new SSS products in the Arctic, as well as illustrate the potential of these maps to monitor the main river discharges to the Arctic Ocean.

[1] Font, J.; Camps, A.; Borges, A.; Martín-Neira, M.; Boutin, J.; Reul, N.; Kerr, Y.; Hahne, A. & Mecklenburg, S. SMOS: The Challenging Sea Surface Salinity Measurement From Space Proceedings of the IEEE, 2010, 98, 649 -665